

INVENTORS DESIGNATION SHEET

TITLE: CONDUCTIVE BUMP FOR SEMICONDUCTOR DEVICE AND METHOD
FOR MAKING THE SAME

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CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority of Taiwanese Patent
5 Application No. 091134055, filed on November 22, 2002.

BACKGROUND OF THE INVENTION

1. Field of the invention

This invention relates to a conductive bump for a semiconductor device, and more particularly to a 10 conductive bump having a paste body sandwiched between first and second metal layers and to a method for making the same.

2. Description of the related art

A semiconductor chip with bonding pads is 15 normally provided with conductive bumps thereon for electrical connection to an electronic device. Conventionally, the conductive bumps are made of tin solder. However, tin solder normally contains a significant amount of lead, which is harmful to the 20 environment. Though lead-free tin solder is commercially available, the same still contains a small amount of lead. As a consequence, tin solder has been widely replaced by conductive paste due to environmental concerns. The conductive paste 25 normally contains a thermosetting resin and a conductive filler, such as silver particulate and carbon particulate.

SUMMARY OF THE INVENTION

Therefore, the object of the present invention is to provide a conductive bump for a semiconductor chip that is capable of overcoming the aforesaid
5 drawback of the prior art.

Another object of the present invention is to provide a method for making a conductive bump on a semiconductor chip.

According to the present invention, there is
10 provided a conductive bump for a semiconductor chip that has a pad-mounting surface which is provided with at least a bonding pad thereon. The conductive bump comprises: a first metal layer adapted to be bonded to the bonding pad; a conductive paste body formed on the first metal layer; and a second metal layer formed on the paste body such that the paste body is sandwiched between the first and second metal layers.
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BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the
20 invention,

Figs. 1A to 1F illustrate consecutive steps for forming a first preferred embodiment of a conductive bump on a semiconductor chip according to the method of this invention; and

25 Figs. 2A to 2F illustrate consecutive steps for forming a second preferred embodiment of the conductive bump on the semiconductor chip according

to the method of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before the present invention is described in greater detail with reference to the accompanying 5 embodiments, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

Figs. 1A to 1F illustrate consecutive steps of forming a first preferred embodiment of a conductive 10 bump 7 (see Fig. 1F) on a semiconductor chip 1 according to the method of this invention. The semiconductor chip 1 has a pad-mounting surface 10 that is provided with at least a bonding pad 11 (see Fig. 1A). The semiconductor chip 1 can be a die on 15 a wafer or a die cut from the wafer.

The conductive bump 7 includes: a first metal layer 4 bonded to the bonding pad 11; a paste body 5 formed on the first metal layer 4; and a second metal layer 6 formed on the paste body 5 such that the paste 20 body 5 is sandwiched between and is enclosed by the first and second metal layers 4, 6. Note that the paste body 5 can be conductive or non-conductive. In this preferred embodiment, the paste body 5 is conductive.

The first metal layer 4 has a base portion 41 bonded to the bonding pad 11, and a peripheral portion 42 extending from the base portion 41 in a transverse direction relative to the base portion 41 and

cooperating with the base portion 41 to confine a recess 40 (see Fig. 1C) therebetween. The paste body 5 fills the recess 40. The second metal layer 6 is connected to the first metal layer 4 and closes the recess 40 so as to enclose the paste body 5 between the first and second metal layers 4, 6.

The method for making the conductive bump 7 includes the steps of: forming a photoresist layer 2 on the pad-mounting surface 10 (see Fig. 1B); patterning the photoresist layer 2 with a mask 3 (see Fig. 1B); etching the photoresist layer 2 to form a through-hole 30 in the photoresist layer 2 so as to expose the bonding pad 11 therefrom (see Fig. 1C); forming the first metal layer 4 on the bonding pad 11 within the through-hole 30 by plating (see Fig. 1C); filling the through-hole 30 with a conductive paste to form the paste body 5 on the first metal layer 4 (see Fig. 1D); forming the second metal layer 6 on the paste body 5 (see Fig. 1E) such that the paste body 5 is sandwiched between and is enclosed by the first and second metal layers 4, 6; and removing the photoresist layer 2 (see Fig. 1F) from the pad-mounting surface 10. The conductive paste employed in the method of this invention is preferably silver paste or silver and carbon paste.

Figs. 2A to 2F illustrate consecutive steps for forming a second preferred embodiment of the

conductive bump 7' (see Fig. 2F) on the bonding pad 11 of the semiconductor chip 1 according to the method of this invention.

The conductive bump 7' of this embodiment is 5 similar to the previous embodiment shown in Fig. 1F, except that the first metal layer 4 does not include the peripheral portion 42 of the previous embodiment.

With the invention thus explained, it is apparent that various modifications and variations 10 can be made without departing from the spirit of the present invention. It is therefore intended that the invention be limited only as recited in the appended claims.